Space Weather Forecast

Issued on Monday 6 January 2025 at 01:10 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Moderate-class flares expected, with an increased chance of Strong-class flares. Slight chance of a glancing CME late 6th or early 7th Jan, with a G1 Minor geomagnetic storm possible.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been Moderate with four Moderate-class flares observed, all originating from a complex sunspot region located in the northeast of the Earth-facing disc. The largest flare events were two M4.1 flares occurring at 05/0239UTC and 05/0936 UTC from the aforementioned sunspot region.

There are currently ten sunspot regions visible on the Earth-facing solar disc. Despite the number of spots, most are small and magnetically simple. A complex spot in the northeast is the largest and most complex spot and has been responsible for the bulk of recent activity, with three strong class flares now recorded since appearing on the solar disc. An active region approaching centre disc and a further active region following it exhibit some magnetic complexity but have remained relatively stable in recent hours. A region in the southwest, despite being magnetically simple, produced two large coronal mass ejections (CMEs) on the 04 Jan, in association with two common-class flares. However, this has shown signs of decay in recent hours. Otherwise there has been little significant changes to the remaining regions on the Earth facing-disc.

The CMEs produced by the active region to the southeast in association with the common-class flares are likely to pass ahead of Earth's orbit. However, there is a slight chance that the latter CME may deliver a glancing blow late on Day 1 (06 Jan) or early on Day 2 (07 Jan).

Solar Wind / Geomagnetic Activity: Solar wind speeds observed by ACE at L1 were strong at 700km/s at the start of the period, but have since declined to elevated levels, currently near 550km/s. This is due to a connection with a coronal hole fast wind. The Interplanetary Magnetic Field (IMF) has been weak to moderate. The north-south component, Bz, fluctuated between negative and positive through much of the period. Geomagnetic activity was mainly Unsettled to Active (Kp3-4) throughout the period.

Energetic Particles / Solar Radiation: High energy proton flux (greater than 10MeV) at GOES18 breached the S1 Minor Storm threshold at 04/2215UTC in response to a C-flare from AR3939 at 04/1827 UTC, peaking at 2.0pfu at 05/0555 UTC and declining below the S1 threshold at 05/0950 UTC.

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 370 900 0100 Email: enquiries@metoffice.gov.uk

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Four-Day Space Weather Forecast Summary

Solar Activity: Activity is forecast to be Moderate to High, with further Moderate flares expected and a chance of further isolated strong flares, mainly from the complex region in the northeast.

Solar Wind / Geomagnetic Activity: There is a slight chance of a glancing blow from a CME (Coronal mass ejection) later on Day 1 (06 Jan) or early on Day 2 (07 Jan), but it is more likely the CME will pass ahead of Earth's orbit. Earth's connection to a high speed stream is expected to wane over the next few days. Elevated solar winds are likely to slowly decline on Day 1 (06 Jan), perhaps returning to background levels by Day 2 (07 Jan).

Geomagnetic conditions are expected to be mainly quiet to unsettled (Kp1-3) through the period, with a slight chance of a few active or G1 Minor geomagnetic storm intervals (Kp4-5) initially in association with the HSS and also later Day 1 (06 Jan) or early Day 2 (07 Jan) if a glancing blow occurs from the aforementioned CME.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) has now decreased back below the S1 threshold after recent enhancement. There is a slight chance of further enhancement over the next few days should any further significant flares occur from the west of the disc.

Geomagnetic Storms

Geomagnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	20	20	1	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

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Radio Blackouts - X-Ray Flares

X-Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 (M Class)	Yes	80	80	80	80
Very Active	R3-R5 (X Class)	No	20	20	20	20

Solar Radiation Storms (High Energy Protons)

Radiation Storms	Level ($cm^{-2}sr^{-1}s^{-1}$)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ S1	Yes	20	20	15	15
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and/or 50 MeV ≥ 10pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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